GroundwaterSoftware.com

GroundwaterSoftware.com
520 Chicopee Row
Groton, MA, 01450
Tel: (978) 502-6001
Fax: (978) 477-0250
E-mail Us Here

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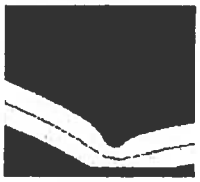


Calculator 9 - Groundwater Mounding Calculator

GROUNDWATER MOUND UNDER A RECTANGULAR RECHARGE AREA

Using the Hantush (1967) Derivation

Back to Calculators

The equation representing the groundwater mound beneath a rectangular recharge area is given by:

$$h_m^2 - h_i^2 = (2w/K)vtS^*((0.5L/(\sqrt{4vt})),(0.5W/(\sqrt{4vt})))$$

where:

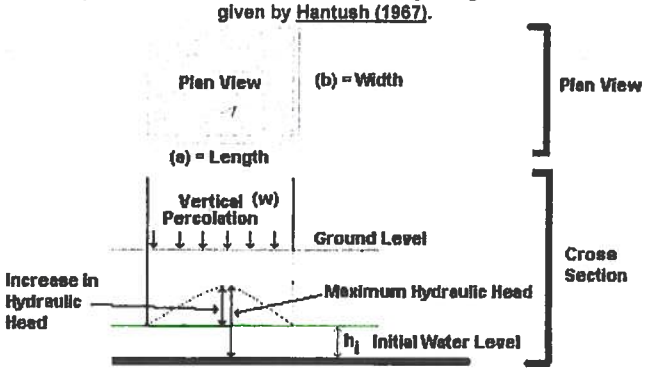
$$v = K\bar{b}/\varepsilon$$

$$\bar{b} = 0.5(h_i(0) + h(t))$$

where h_m is the maximum height of the mound; h_i is the initial height of the water table; w is the recharge or percolation rate; K is the hydraulic conductivity; t is the time of interest; L and W are the length and width of the rectangular recharge area, and ε is the specific yield of the aquifer. S* is an integral equation given by:

$$S^*(\alpha,\beta) = \int_0^1 erf(\frac{\alpha}{\sqrt{\tau}}) \cdot erf(\frac{\beta}{\sqrt{\tau}}) d\tau$$

This equation is estimated in the calculator by using a table of values given by Hantush (1967).



GROUNDWATER MOUND UNDER A RECTANGULAR RECHARGE AREA
Using the Hantush (1967) Derivation

Inputs

w (Percolation Rate): 2.64 [L/T]
K (Hydraulic Conductivity): 40 [L/T]
S (Specific Yield): .32 [-]
t (Time): 1 [T]
h_i (Initial Saturated Thickness): 75 [L]
a (Length of Recharge Area): 140 [L]
b (Width of Recharge Area): 50 [L]

****KEEP UNITS CONSISTENT****

Calculate

Results

****Note that because of estimations of an integral function, this is an estimate****

Maximum hydraulic head: 76.2561739 [L]
Increase in hydraulic head: 1.25617397 [L]

Hantush, M.S.(1967). *Growth and Decay of Groundwater-Mounds in Response to Uniform Percolation*, Water Resources Research vol. 3, no.1, pp 227-234.

Example:

What is the maximum mounding at the water table if 1000 liters/day of water is discharged on an area 3 x 4 m after 2 days (all water infiltrates). Given a hydraulic conductivity of 1 x10^{-6} m/s, and specific yield of 0.01 and an initial saturated thickness of 2 m.

Your results should yield a maximum hydraulic head of approximately 3.3 m and an increase in hydraulic head of 1.3 m.

What might have gone wrong?

- converting from 1000 liters/day to m/day. Convert to m3/day using 1000 liters/m3, then divide by area to get the m/day of water infiltrating. This value should be approximately 0.08 m/day

-converting the hydraulic conductivity to units of m/day. This value should be approximately 0.086

Summary

Inputs
w = 0.08 m/day, K = 0.086m/day, S=0.01, t = 2 days, hi = 2 m, a = 3m, b= 4 m

Results

Maximum hydraulic head = 3.3 m
Increase in hydraulic head = 1.3 m

See our Newsletter on Groundwater Mound Under a Rectangular Recharge Area and December Specials

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